

IX.—*Notes on the land and fresh-water shells of Kashmir, more particularly of the Jhilum valley below Srinagar and the hills North of Jamu.*—*By W. THEOBALD, Geological Survey of India.*

(Received 27th June;—Read 3rd July, 1878.)

The present notes embody the results of a hasty traverse of the ground from Mari to Srinagar and thence *viâ* the Mohu pass to Jamu, during the very unfavourable months of March and April last year, and it is to be hoped that the rather meagre list here given may be hereafter enlarged very considerably by others who may have more leisure, and a more favourable season for their investigations than I could command.

In the list of Kashmir mollusca appended to these notes, an asterisk marks those species not obtained by myself personally.

MELANIA TUBERCULATA, Müll.

A small race of this widely spread shell occurs in the outer hills.

VALVATA PISCINALIS, Müll.

Abundant on the river mud in pools under the Travellers' Bungalow at Soper.

BITHYNIA PULCHELLA, B.

Common in the valley.

HYALINA LUCIDA, Drap.

H. FULVA, Drap.

Both species occur on the Panjâl range and are common in the debris of streams running into the valley.

MACROCHLAMYS INDICA, B.

M. vitrinoides, auctorum (*non vera*).

M. petrosa, Hutton.

This widely spread species is rather rare in the outer hills. A single mature shell only was met with, much smaller than the type, and measuring only $18 \times 15 \times 7$ mm. An immature shell was a trifle larger.

M. SPLENDENS, Hutton.

Colour bright chestnut, with a lustrous polish. My largest shell is not quite adult, and measures $15 \times 13 \times 8$ mm. A dead adult shell is a trifle smaller. It shows the mouth very oblique and shaped much as in *M. aspidēs*, with the lip thickened inside as in *Hemiplecta monticola*. This species occurs rather plentifully in places above Uri, nestling under stones.

M. PATANE, B.

A few dead specimens of what seems a small race of this species were obtained above Uri, one specimen measured $9 \times 7.7 \times 5$ mm.

MACROCHLAMYS, sp.

A single dead shell of a species resembling *M. levicula* was found with the last, above Uri, measuring $6 \times 5 \times 4.5$ mm.

KALIELLA BARRAKPORENSIS, Pfr.

A single specimen of this widely spread species, measuring 6 mm. in height, was found in Kashmir. The specific name is badly chosen, as this is a hill species, (not found on the plains, unless transported on plants), and ranges throughout the Himalayas and also the mountain ranges of Southern India.

HEMIPLECTA MONTICOLA, Hutton.

H. labiata, Pfr.

Generally distributed throughout the Western Himalayas. In the valley of the Bichlári river, an affluent of the Chináb, this species occurs remarkably fine and in incredible numbers in the fissures of rocks, though few live specimens were procurable at the time of my visit. The colour of the shell is dark chestnut both above and below, and there are four or five prominent pale bars or transverse stripes, marking the seasonal arrest of growth and the position of successive epiphragms, formed during the period of hibernation. The epidermis is very thin and pale yellow, and the shell does not attain maturity under seven or eight years. The first five whorls are minutely shagreened, the remaining ones smooth but more or less transversely rugose.

My largest specimen measures $47 \times 39 \times 23$ mm. The species is particularly common below Nachilana in the Bichlári valley.

H. JAMUENSIS, n. s.

Aspectu inter H. monticolam et H. ligulatam. Testá solidá, convexá, anguste umbilicatá, supra levissime granuloso-corrugata (H. ligulatæ modo) subter lævigatá. Colore supra pallide brunneo, subter albido. Anfractibus sex, lente crescentibus. Labio intus incrassato, simplici. Attinet ad $27 \times 23 \times 14$ mm.

Habitat in valle Jawi, inter Chineni et Adampur.

This species might be regarded by some as an impoverished race of the last, from which I have little doubt it is proximately derived, but it differs too much in size, colour, form, and range to be properly united therewith. Mr. W. Blanford suggests it may be the *H. monticola* of Pfeiffer, which is very likely. I have unfortunately no live shells, but the type of colouration in my best specimens is more of the type of *ligulata* than of *monticola*, being white below. It is I think clearly a species descended from *H. monticola*, and modified to meet the climatal conditions of the Jawi valley below Chineni, where the winter cold and summer heat are both more intense than is suitable for *monticola* on the one hand, or *ligulata* on the other.

TROCHOMORPHA HYBA, B.

Two dead adults and a living half grown shell were obtained by me on the hills behind Aijas, to the east of the Walar lake. The largest specimen measured $17 \times 16 \times 11$ mm. It recalls the Nilghiri *Thysonota guerini*, but the animal belongs to the *Zonitidæ*.

This species occurs occasionally in thickets between Dalhousie and Chamba between 6000 and 7000 feet above the sea.

HELICARION FLEMINGII.

This species is not rare in the outer hills and two distinct races are discernible: the one (*a*) being confined to the higher and moister hills, whilst the other (*b*) occupies the warmer valleys and the drier ranges of less elevation.

a. My finest specimens of this race are from near Mari (Murree) where they were collected by my colleague Mr. Wynne. The finest measure $42 \times 31 \times 20$ mm., though shells rarely attain this size. Shells of the ordinary dimensions of 35 mm. are not rare in parts of the Jhilum valley about Uri, and even among the outer hills, and occur subfossil in the valley deposits (clays) in many places outside the main ranges and in the Suttlej valley. The reputed locality of the type, 'Sind', is open to considerable doubt, unless the specimen was imported in a plant case. In five specimens the lower part of the shell is lustrous, whilst the upper half has a dull silky sheen, from innumerable fine *striæ* which cover the surface.

b. This race runs considerably smaller than the last, the largest specimen of some hundreds measuring $22 \times 17 \times 12$ mm. It is a miniature of the last, and occurs abundantly in the Chináb valley above the junction of the Bichlári river and also at Dharmśála in the Kángra valley. The shell is almost wholly enveloped by the mantle when the animal is in motion.

There is yet another race which may perhaps prove a distinct species, but which at present I prefer to consider as a variety of the larger form of *H. flemingii*, and which I will term provisionally:—

c. var. *altivagus*. Of this form I have only a few dead shells. The largest measures $31 \times 23 \times 14$ mills. and it differs from the type by being much flatter. I only met with it sparingly above Uri.

H. SCUTELLA, B.

Sparingly distributed in the Western Himalayas at moderate elevations. The body delicately arched, like the outline of a triton's tail. This species occurs with the small race of *H. flemingii* both in the Chináb valley and at Dharmśála though nowhere so numerous.

H. MONTICOLA, B.

There is some confusion between this species, the last, and the next, which, without more information, I cannot clear up. Specimens received

by me from Benson under this name were certainly closely allied to the last. In the *Conchologia Indica*, however, a very different shell is figured (Plate CLII, figs. 1, 4,) and one which seems barely distinct (save in size only) from *H. cassida*, Hutton, also given on the same Plate. My coadjutor, Mr. Hanley, purchased most of Benson's types, but has most unfortunately not said if the figure is taken from one of them.

My own impression is, that *H. monticola*, B. is a near ally of *H. scutella*, B. and that the *monticola* figured in the *Conchologia Indica* is a mere immature specimen of *H. cassida*, Hutton. It is true the shell is said to be in one 'dull' in the other 'lustrous', but this may be the result of its condition, as in *H. flemingii*, the lustrous surface of the shell is covered with a dull epidermis, which in *scutella* is wanting, and I was much struck with the presence of this dull epidermis, as it is covered by the mantle; the shells of other *Zonitidæ* under such circumstances being usually lustrous.

H. CASSIDA, Hutton.

A single adult specimen of what I consider this species was taken by me under a stone above Uri. Two young shells (one of them forwarded to me by Mr. Lydekker) also seem to belong to this species, though the mouth is rounder and deeper than in the adult (*vide* *Conch. Indica*, Plate CLII, figs. 2, 3). This species might almost be ranged in *Paryphanta* and would seem to be rare as I have only seen the above three specimens.

VALLONIA PULCHELLA, Müll.

V. COSTATA, Müll.

The higher ranges.

FRUTICICOLA HUTTONI, Pfr.

Widely distributed, but individuals do not seem anywhere numerous.

PERONEUS CÆNOPICTUS, Hutton.

Widely distributed and individuals numerous. In the North-western Punjab, this species harbours under stones, and is variable in size.

NAPÆUS CANDELARIS, Pfr.

N. domina, B. This is a common species being found about Mari and in various places in Kashmir, usually above 6000 feet, but occasionally lower. Sinistral shells are most numerous, but dextral ones also occur not rarely. My largest sinistral shell measures 35.6×9.2 and my smallest 27.7×8.7 mm. The dextral shells are smaller, ranging from 33×8.8 to 24×8.5 mm.

The shells vary somewhat in a large series, in tumidity and in the attenuation of the spire, and even in the number of whorls, a remark which applies to all the species of the genus, and proves the risk of creating new species from single examples.

I do not think that *N. domina*, B. can be separated, as the main distinction seems to be in the texture of the shell; but in this group the texture varies from horny and sub-diaphanous, in which the striped markings are conspicuous, to creamy porcellanous, in which they are more or less if not wholly obsolete. The difference too in this respect is considerable between the living and dead shells, and largely depends (unless I am much mistaken) on the conditions of climate and alimentation under which the animal lived.

A slender form is seen in places, with a thinner shell than the type, and indicating a passage to *N. kunawarensis*, Hutton. A typical example of this variety measures 26.5×8 mills.

In the above and in all the measurements which follow the short axis is measured just behind the aperture.

N. SINDICUS, B.

Of this species both dextral and sinistral shells occur, the former most numerous. The size ranges between 27×8 and $17 \times 3 \times 6.6$ mm. for dextral shells and 22×7 and 18.2×6.2 mm. for sinistral ones out of a large series. It occurs abundantly in the Jhilum valley about Chatur, (above Kohalā) at low elevations, and elsewhere less commonly up to 3000 feet or thereabouts.

N. CÆLEBS, B.

This is a forest species, usually ranging from 5000 feet upwards. It is the most variable species of the group, both as regards size and form ranging from 22×8 to 14×6.2 mm. Some systematists might easily make six or eight species out of the varieties of this shell; but with a large, but by no means exhaustive, series before me, I cannot venture to specifically separate the very variable shells which a large series displays. I have never seen a sinistral specimen, but *N. boysianus*, B. looks like a sinistral example of the largest form of *cælebs*.

N. ARCATUS, Hutton.

Kashmir specimens range between 2×6.1 and 13.7×5 mills. A single dextral shell found by me measures 12×4 mills. It does not seem a common species. The habitat 'Moulmein' given in the Conchologia Indica is of course absurd, but for this and similar blunders I am nowise responsible, since the publishers declined to furnish me with proofs, as the work went through the press.

N. SEGREGATUS, B.

A single specimen of what seems a variety of this shell was found, but it had an abnormal look about it. It measures 11.2×5 mm and has the ordinary horny appearance of *cælebs* and its allies. A smaller form, var. *pusillus*, would seem to belong to this species and is far from rare on the Chináb valley above 6000 feet. It only measures 9×3.8 mills.

N. PRETIOSUS, Cantor.

The type was obtained near the Jhilum on the well-contested battle-field of Chilianwalla. The species also occurs sparingly throughout the Jhilum valley below Uri, but is nowhere common except about Kathai fort on the right bank, where it is abundant, though I saw only dead shells. The range of this species must be very limited, as I have not noticed it to the eastward, or anywhere in the cis-Rávi country.

N. SMITHII, B.

An occasional individual of what I take to be this species, is here and there met with in the Jhilum valley below Uri, but I have only seen dead shells. It also occurs at Mari, where I have seen a few specimens, a trifle smaller than the type. My best specimen measures 11.1×3.5 mm. and exhibits the characteristic dilatation of the peristome.

N. RUFISTRIGATUS, B.

Common on the outer hills from the Jumna to the Indus. Closely allied to this species and with difficulty separable in a large series, are *N. eremita*, B., *N. indicus*, B., *N. salsicola*, B. and *N. spelæus*, Hutton, these two last forms being erroneously placed in my Catalogue (Thacker and Co., 1876,) under *Cylindrus*.

OPEAS GRACILIS, Hutton.

The outer hills bordering the plains, but not noticed in the valley.

CYLINDRUS INSULARIS, Ehr.

The outer hills and plains.

PUPA MUSCORUM, L.*P. GUTTA*, B.

Both these species no doubt spread over the higher ranges of Kashmir, though the type of the latter species has only been taken by me in Spiti.

P. HIMALAYANA, B.*P. HUTTONIANA*, B.

Both these species occur abundantly on the Panjál range and in the debris of streams flowing therefrom, whence they are carried down during floods into the plains.

P. — sp.

A single specimen of a *Pupa* somewhat of the *plicidens* type occurred in the Jhilum valley with numbers of the last two species. I do not know it, but hesitate to describe it as new, till it has been compared more fully than I have at present means of doing.

Alt. 2.5 mm.

CLAUSILIA CYLINDRICA, Gray.

I did not take this species in Kashmir, but as I took it in Dharmasála a little east of the Rávi, I have no doubt that it should be included in the Kashmir fauna.

C. WAAGENI, Stol.

A single dead shell of what is probably this species was found by me a little below Rámpur the first stage below Baramula. The type was found near Mari, and it doubtless ranges into Kashmir in suitable localities.

ENNEA BICOLOR, Hutton.

The outer hills, where it is almost invariably associated with *Opeas gracilis* and *Peronæus cænopictus*.

CÆLOSTELE SCALARIS, B.

GEOSTILBIA BALANUS, B.

Both these species are found in the outer hills bordering the plains, the former rather rarely.

LYMNÆA.

The species of this genus do not call for remark.

PLANORBIS.

Several small species of this genus, which my opportunities did not allow of my recording, have no doubt to be added to the Kashmir fauna.

CORBICULA KASHMIRENSIS, Desh.

My largest specimen, from near Soper, measures $45 \times 39 \times 23$ mm. Smaller specimens occur lower down the Jhilum near Baramula.

C. OCCIDENS, B.

Accompanies the last. My largest specimen measures $21 \times 17.5 \times 11.5$ mm. In Kashmir specimens the rufous rays (which Hanley says are rarely present) are rarely absent, but never very strongly marked and sometimes with difficulty visible.

SPILÆRIUM INDICUM, Desh.

PISIDIUM HYDASPICOLA, n. s.

Testâ sub-cordate ovali-tenui, exilissime striatâ, antice rotundatâ, postice vix truncatâ $4 \times 3.4 \times 2.5$ mm.

Habitat valle Kashmirense, in fluminibus ad Hydasphem fluentibus, prope Shypion.

The nearest ally of this species is *P. clarkeanum*, Nev., but it is more rounded in front and hardly truncated behind.

A single specimen only was found in the stream near Shypion, a feeder of the Jhilum.

The above is a very imperfect list of the shells of so diversified a region as regards surface and climate as Kashmir. The correct determination of the smaller fresh-water species of *Bithynia* and *Planorbis*, and of the species of *Sphærium* and *Pisidium* which almost certainly occur is difficult. *Unio* I have not noticed in the valley.

At page 41 of my Catalogue of Indian shells, I have given the Pûnch Hills as a habitat of the operculate *Megalomastoma funiculatum* of Sikkin,

on the authority of shells received from Mr. Lydekker with that habitat, which subsequent enquiry has served to render extremely doubtful, and I have accordingly excluded the species from the Kashmir fauna.

In conclusion I would urge that visitors to Kashmir could hardly fail to add many species to the above list if they carefully collected in the higher ranges, and along routes not visited by me, especially the smaller species of *Pupa*, &c. which are most conveniently sought for among the light *rejectamenta* and vegetable refuse swept down by floods, and heaped up along the banks of streams in sheltered spots.

List of land and fresh-water shells, presumably inhabiting Kashmir and its vicinity. Shells, not seen by me, marked by an asterisk.

Paludomus tanjoriensis, Gmel.*

Melania tuberculata, Müll.

M. variabilis, B.*

Valvata piscinalis, Müll.

V. stoliczkana, Nevill.* (Cat. Moll. Ind. Mus.)

Vivipara bengalensis, Lam.*

V. dissimilis, Müll.*

Bithynia pulchella, B.

Hyalina lucida, Drap.

H. fulva, Drap.

Macrochlamys indica, B.

M. splendens, Hutton.

M. patane, B.

M. sp.

Kaliella Barakporensis, Pfr.

Hemiplecta monticola, Hutton.

H. jamuensis, Theob.

Trochomorpha hyba, B.

Helicarion cassida, Hutton.

H. flemingii, Pfr. (type and *var. minor*.)

H. flemingii, *var. altivagus*, Theob. (*an sp. nov.?*)

H. monticola, B.

H. scutella, B.

Fruticicola huttoni, B.

Vallonia pulchella, Müll.

V. costata, Müll.

Peronæus cænopictus, Hutton.

Napæus candelaris, Pfr.

N. indicus, B.

N. cælebs, B.

- N. arcuatus*, Hutton.
N. pretiosus, Cantor.
N. segregatus, B.
N. smithii, B.
N. rufistrigatus, B.
N. vibex, Hutton.
Cylindrus insularis, Ehr.
Pupa muscorum, L.
P. gutta, B.
P. himalayana, B.
P. huttoniana, B.
P. sp.
Succinea pfeifferi, Ross.*
Clausilia cylindrica, Gray.
C. waageni, Stol.
Ennea bicolor, Hutton.
Opeas gracilis, Hutton.
Zua lubrica, Müll.*
Glessula huegeli, Pfr.*
Cælostele scalaris, B.
Geostilbia balanus, B.
Carychium indicum, B.*
Lymnæa luteola, Lam.
L. peregra, Müll.
L. stagnalis, Müll.
L. auricularia, Müll.
L. truncatula, Müll.
Planorbis calathus, B.*
P. exustus, Desh.
P. carinatus, Müll.
Corbicula kashmirensis, Desh.
C. occidents, B.
Sphærium indicum, Desh.*
Pisidium hydaspicola, Theob.
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